

U.S. Patent Application Serial No. 10/618,717
Amendment filed May 6, 2005
Reply to OA dated February 16, 2005

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1. (Currently Amended): A field-effect transistor comprising:

a channel layer that is formed on a predetermined semiconductor layer and has an impurity concentration varying from a low value to a high value; and
a source region and a drain region each having a bottom face above an interface between the predetermined semiconductor layer and the channel layer and provided within the channel layer.

Claim 2. (Original): The field-effect transistor as claimed in claim 1, wherein the impurity concentration varies linearly or exponentially.

Claim 3. (Original): The field-effect transistor as claimed in claim 1, wherein the impurity concentration is $1.0 \times 10^{16}/\text{cm}^3$ or higher.

Claim 4. (Original): The field-effect transistor as claimed in claim 1, wherein the impurity contained in the channel layer is at least one of selenium, silicon, carbon, beryllium, and magnesium.

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Claim 5. (Currently Amended): A field-effect transistor comprising:
a channel layer that is formed on a predetermined semiconductor layer and has a composition ratio varying in which a saturation electron velocity varies from a low value to a high value as getting away from the predetermined semiconductor layer; and
a source region and a drain region each having a bottom face above the predetermined semiconductor layer.

Claim 6. (Original): The field-effect transistor as claimed in claim 5, wherein the channel layer has the composition ratio of a predetermined material linearly or exponentially decreasing or increasing as the distance from the predetermined semiconductor layer increases.

Claim 7. (Original): The field-effect transistor as claimed in claim 5, wherein the predetermined material is at least one of gallium, indium, aluminum, and antimony.

Claim 8. (Original): The field-effect transistor as claimed in claim 1, wherein:
the predetermined semiconductor layer is a buffer layer that is formed on a semiconductor substrate;
and
the bottom faces of the source region and the drain region are located within the channel layer.

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Claim 9. (Withdrawn): A method of producing a field-effect transistor, comprising the steps of:

growing a channel layer on a predetermined semiconductor layer, while varying an impurity concentration from a low value to a high value; and
forming a source region and a drain region each having a bottom face above the predetermined semiconductor layer.

Claim 10. (Withdrawn): The method as claimed in claim 9, wherein the step of growing a channel layer includes linearly or exponentially increasing the impurity concentration during the growth of the channel layer.

Claim 11. (Withdrawn): The method as claimed in claim 9, wherein the step of growing a channel layer includes linearly or exponentially increasing the temperature of an effusion cell for the impurity to be introduced into the channel layer.

Claim 12. (Withdrawn): The method as claimed in claim 9, wherein the impurity is at least one of selenium, silicon, carbon, beryllium, and magnesium.

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Claim 13. (Withdrawn): A method of producing a field-effect transistor, comprising the steps of:

growing a channel layer on a predetermined semiconductor layer, while varying the composition ratio of a predetermined composition from a low value to a high value; and

forming a source region and a drain region each having a bottom face above the predetermined semiconductor layer.

Claim 14. (Withdrawn): The method as claimed in claim 13, wherein the step of growing a channel layer includes linearly or exponentially increasing or decreasing the flow rate of a gas containing a predetermined organic metal.

Claim 15. (Withdrawn): The method as claimed in claim 14, wherein the predetermined organic metal is trimethylgallium and/or triethylgallium, trimethylindium, trimethylaluminum, or trimethylantimony.

Claim 16. (Withdrawn): The method as claimed in claim 13, wherein the step of growing a channel layer includes linearly or exponentially increasing or decreasing the temperature of an effusion cell for the material that forms the predetermined composition.

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Claim 17. (Withdrawn): The method as claimed in claim 13, wherein the predetermined composition is at least one of a gallium composition, an indium composition, an antimony composition, and an aluminum composition.

Claim 18. (Withdrawn): The method as claimed in claim 9, wherein the step of forming a source region and a drain region includes implanting predetermined ions to such a depth that does not reach the predetermined semiconductor layer.